

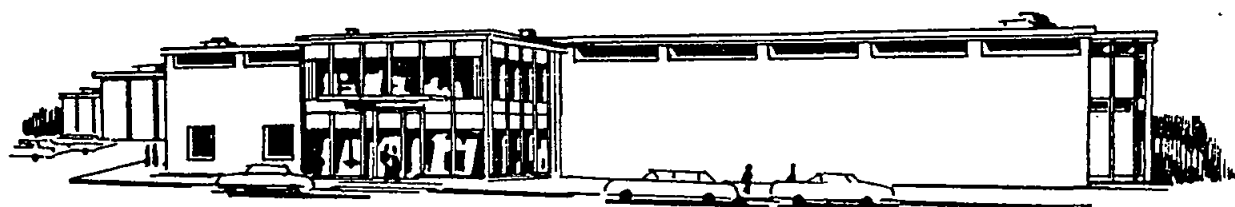


# Schjeldahl /

ADVANCED  
PROGRAMS  
DIVISION

G. T. SCHJELDAHL COMPANY • NORTHFIELD, MINNESOTA 55057 • PHONE 507-645-5633

REPORT  
ON  
SKYHOOK 1966




PUTTING TOMORROW'S MATERIALS TO WORK TODAY

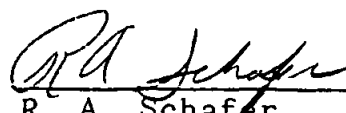
REPORT  
ON  
SKYHOOK 1966

For  
Office of Naval Research  
Washington 25, D. C.

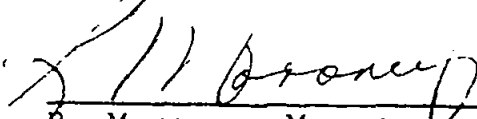
This Research was sponsored by  
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## 1.0 INTRODUCTION

Amendment No. 3 to contract NONR 4859(00), dated 7 June 1966, required the G. T. Schjeldahl Company to conduct a series of high altitude Skyhook balloon flights from Flin Flon Municipal Airport of Bakers Narrows, Manitoba, and from the Churchill Research range, Fort Churchill, Manitoba. The purpose of the flights was to secure data for Dr. Kinsey A. Anderson of the Space Sciences Laboratory, Department of Physics, University of California at Berkeley, for his studies of radiation associated with solar magnetic storms. The research was sponsored by the National Science Foundation. Originally, fifteen flights with no more than seventeen launches were scheduled from Flin Flon, and fourteen flights with no more than sixteen launches from Churchill. However, this was later amended to provide for eighteen flights from Flin Flon with no more than eighteen launches.

The balloon flights were scheduled for the period 15 August to 15 October, 1966 with Schjeldahl responsible for furnishing flight safety and control instrumentation, launching, tracking, and recovering; establishing and maintaining close liaison with scientific investigators, airport officials, and Canadian authorities; and advising and assisting the scientific experimenters as necessary.

Seventeen launches were actually made at Flin Flon with thirteen successful flights, and thirteen launches were made at Churchill with ten successful flights.

## 2.0 PLANNING

Little advance planning was required for these flights since the Schjeldahl flight crew had been at Flin Flon the previous summer and was familiar with the facilities available. However, a list of the required equipment had to be prepared, long lead time articles ordered, and shipping arrangements made. This required most of the months of May, June, and part of July.

## 3.0 EQUIPMENT

### 3.1 BALLOONS

The balloons for the program were furnished by the Office of Naval Research. The following table shows the number of each type furnished and the manufacturers.

TABLE 1

	No.	Manufacturer	Film Thickness (mils)	Size ( $10^6$ ft)
Flin Flon	7	Raven	1/2	3 *
	2	Raven	3/4	1/4*
	5	Winzen	1/2	3
	4	Winzen	1/2	1/4
	1	Winzen	3/4	3
	1	Raven	3/4	3
Churchill	10	Winzen	1/2	1/10
	1	?	1/2	1/2
	4	Winzen	1/2	1/4

\* These balloons surplus from 1965 Skyhook.

### 3.2 INSTRUMENTATION

Aircraft tracking and recovery was not a requirement of either of the flight series so the balloons were tracked by a GMD transmitter incorporated into the Schjeldahl barocoder. Most of the balloons were tracked by the GMD at Flin Flon and radar at Churchill. On flights not requiring a positive track, a 72 MHz transmitter was used, and telemetry

received on a VHF telemetry receiver.

The barocoder provided resolution of less than 1/10 millibar at altitude. It was combined with a predetermining digital counter to provide a system in which the timing sequences could be easily changed up to the final flight checkout. The backup timer was a governed dc motor with a predetermining digital counter allowing settings up to the final check. The entire unit consisting of barocoder and timers was insulated with 2-inch thick fiberglass batting. The aneroid capsules in the barocoder were the multiple diaphragm type. Block diagrams of the flight units are shown in figure 1.

### 3.3 OTHER EQUIPMENT

The other equipment shipped to Canada was as follows:

- 2 truck tractors
- 2 26-tube helium trailers
- 2 38-tube helium trailers
- 1 30-ft van trailer, containing balloons, ballast, GMD and miscellaneous launch equipment
- 1 Hilton mobile home
- 1 crew cab pickup
- 1 electronics unit van containing flight instrumentation, shop equipment, communications equipment, vacuum stand, tool boxes, work benches, other launch equipment, and personal clothing for the crew.

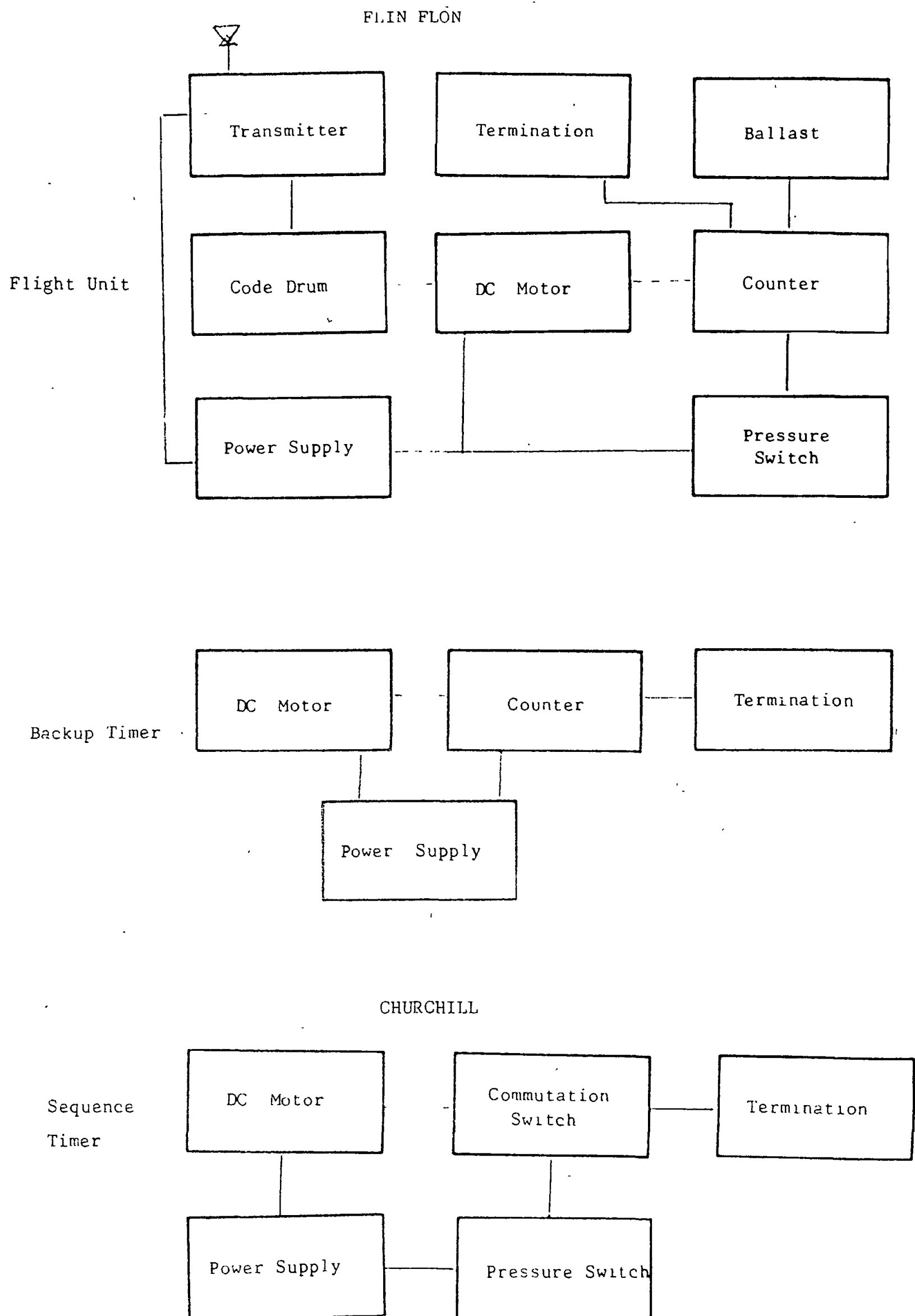


FIG. 1 BLOCK DIAGRAMS OF FLIGHT INSTRUMENTATION

## 4.0 LOGISTICS

All items were shipped on Government bills of lading furnished by the Office of Naval Research. On July 26, the four helium trailers were loaded on two piggyback flatcars at Minneapolis by the Great Northern Railroad. On July 29, the remainder of the vehicles were loaded at Northfield on three TTX tie-down-equipped machinery flat cars furnished by the Great Northern Railroad. These cars were dispatched on August 1. This method of shipping greatly facilitated loading and unloading operations which took 2 days or less each time. Unloading a piggyback flat car requires an endloading ramp; however, the other cars can be handled from side loading ramps. All equipment was shipped back the same way except the Hilton trailer which was left at Flin Flon airport for future ONR use. Other balloons and equipment were shipped to Churchill by rail express.

## 5.0 FIELD OPERATIONS

### 5.1 COORDINATION

To insure a successful operation, coordination was effected by the Office of Naval Research Field representative and the Schjeldahl Company Project Engineer with the Canadian Department of Transport, the Canadian National Railway, the Churchill Research Range, the Airport Manager at Flin Flon, and others whose services and cooperation were essential.

### 5.2 QUARTERS AND LOCAL COMMUNICATION

The University of California personnel were quartered at the Paradise Lodge. The ONR representative and the G. T. Schjeldahl Company crew stayed at the Flin Flon Hotel. Telephones were installed at the Airport, one in the University of California trailer, and one in the Hilton mobile home. For communications from the Paradise Lodge to the Airport, the California group used a VHF 8 watt portable radio phone. Between the flight line and the telemetry van portamobiles were used.

### 5.3 LAUNCH METHOD

After the balloon box was opened, it was loaded from the van trailer on to the back of a pickup truck and a roller attached to the top of the box. The ground cloth roller was mounted on brackets attached to the rear bumper of the pickup, while the launch arm was mounted on the front bumper of the helium tractor-trailer combination. The flight instrumentation, ballast, and parachute were placed on a fiberglass launch cart equipped with four, full castering, 3-inch wheels. After moving the two

vehicles out onto the runway or taxiway for layout, the helium tractor was positioned to face directly downwind in line with an erected pibal. The pickup truck, with the balloon flight system, was positioned ahead of the tractor; as it was driven away the 60-inch wide, waterproof, hypalon-coated nylon ground cloth and the balloon were dispensed simultaneously. This eliminated much handling and saved time. After the balloon layout was complete, the launch dolly was removed from the truck and positioned at the balloon base fitting, the flight instrumentation was attached, and the anchor line laid out downwind. The pickup was then driven to the end of the anchor line which was attached to the front bumper of the pickup.

Meanwhile, flight instrumentation was prepared and flight trains rigged in the electronics unit van. When the scientific payload was ready, it was attached to the base of the parachute by 30 feet of 500-pound-test nylon line. As soon as the experimenter was ready, inflation of the balloon began. As inflation progressed, the balloon was de-reefed by moving the helium tractor and trailer forward a foot or two at a time.

After the metered inflation and the final check of the scientific payload was complete, all was ready for launch and the pibal was released. At launch, one man was stationed at the launch arm, two men at the balloon instrumentation, one man in the anchor truck with command of the anchor line squibs, while the launch director remained beside the two persons carrying the scientific gondola and antenna. This location made it easy for his commands to be heard and the anchor line to be released when he desired.

At Churchill, because the balloons were much smaller and the payloads lighter, the "Huch-Clutch" launch method was used.



## 6.0 PROBLEMS

### 6.1 ANEROIDS

The aneroids were not received until after the main shipments had been made to Flin Flon and Churchill; therefore, the final assembly had to be made in the field. This was inconvenient but caused no particular difficulty.

### 6.2 BELLJAR

The G. T. Schjeldahl Company furnished a vacuum system with the flight operations equipment. In moving the vehicles after setting up, the bell-jar part of the system was inadvertently cracked. A slightly smaller jar was loaned by the Hudson Bay Mining and Smelter Co. until a replacement could be received from Northfield. The smaller jar was adequate for calibrating instruments.

### 6.3 GMD TRANSMITTERS

One box containing the GMD transmitters shipped to Flin Flon in the van was lost and never found. The ONR representative arranged with the Churchill Research Range and the University of Minnesota Physics Department for replacement units.

### 6.4 SQUIBS

On the sixth balloon flight when all was ready for launch the timer was started and two squibs blew. After extensive checking, a replacement unit was attached and the first unit then taken back to the van and thoroughly checked. The premature firing was traced to the plug which connected two hot pins before a ground was made. To prevent any recurrence of this on subsequent flights, the timer was plugged in and started before the squibs were hooked up.

### 6.5 POWER

The electric power of the Flin Flon airport was 240 V, single phase. The 240 volts was split and brought down the pole to two outlets, the University of California using one and Schjeldahl the other. The Hilton mobile home and GMD system was on the Schjeldahl leg. Because of high line loss to the building which the California crew was using for check-out, their oscilloscope would not function properly. They moved their check-out equipment and instrumentation to the Hilton trailer and used

the G. T. Schjeldahl oscilloscope without further difficulty.

## 6.6 BALLOONS

On a number of the Winzen taped balloons, loose tapes were found. Some stuck on other portions of the balloon, and some not. When this tape was peeled, it caused holes in one balloon. Exposed portions of the balloon were closely inspected for this defect, and where the tape was found to be stuck to another portion of the balloon, the tape was removed and the balloon repaired. It was not possible to go over the complete balloon, however, and some of these defects could have easily been missed. The top end fitting also had a very long rough eye bolt and one of the recovered balloons the top was shredded around this. On subsequent flights the eye bolt was wrapped.

No apparent reason was found for balloon flights numbers 4, 12, and 13 to be leakers and balloon flight number 2 to have burst. The rest of the flights were successes although flight number 14F66 climbed beyond its theoretical altitude. Flight numbers C-3, C-4, and C-11, launched at Churchill, failed. The balloon for C-11 was in a very dilapidated box and appeared to have been previously unrolled for flight, then rolled up and put in a different box. This balloon was left over from past years operations.

## 6.7 INTERFERENCE WITH AIRCRAFT

The normal launch area at the Flin Flon airport was the North-South strip, the only runway. A number of the launches had to be made in daylight hours. During one of these, the balloon was laid out at the taxi intersection when a nonscheduled aircraft landed on the north end of the runway. Another time the balloon had been laid out in the same general place when a nonscheduled aircraft wanted to leave. He delayed his flight until the balloon was launched. When a balloon flight would interfere with a scheduled aircraft, the balloon was laid out and launched from the grass along side the runway.

## 6.8 BALLOON RECOVERY

Two of the 4 failures were recovered with a single engine aircraft. On flight number 2 the ONR representative, Mr. Evanick, and Mr. Schafer went on a search mission as plotted from wind data. The balloon was sighted by Mr. Evanick and the position indicated on the map near The Pas. The following day Mr. Schafer and Mr. Spons drove down to The Pas in the crew cab pickup, but found no roads into the area. A boat was rented to go up the river near the balloon location. Ducks Unlimited had a muskeg swamp-buggy which they loaned to the men along with a driver. The area was searched but because of the 8-foot high swamp grass the

balloon was not sighted. The following day Mr. Merrell, Mr. Spons, and Mr. Schafer flew down and took another position on the balloon. Mr. Merrell and Mr. Spons then went in the boat to the site and Mr. Schafer directed them to the balloon from the air. Though they were within 50 feet of the balloon they could not see it from the swamp-buggy. Flight number 12 was also recovered from near Wabowden, Manitoba. Mr. Schafer and Mr. Spons were on the search mission and located the balloon. The following day they went after it in a float plane with a canoe tied on the pontoon. They canoed in about 10 miles direct, but more than twice that on the surface, and with directions from the float plane, hiked in and brought the package out.

## 7.0 FLIGHT DETAILS

Details concerning each flight are shown in Table 2.

## BALLOON

TABLE 2

Flight No.	No.	Size 10 <sup>6</sup> ft <sup>3</sup>	Weight lbs	Parachute Diameter (ft)	Launch Date time GMT	Weather Sky	Temp (° F)	Winds	Ballast (lbs)	Package (lbs)	Gross WT (lbs)
1-F-66	W 33	1/4	60	8	Aug. 19 2054	Clear	55	N-3	0	42	102
2-F-66	W 34	1/4	60	8	23 2042	Ovest	65	SW-5	0	41	101
3-F-66	W 251	3	343	20	23 2300	Sctd	55	WSW-7	65	93	500
4-F-66	W 31	1/4	58	12	26 0236	Sctd	72	N-8	0	38	96
5-F-66	W 252	3	342	20	29 1713	Sctd	62	S-5	65	90	497
6-F-66	W 253	3	351	20	29 2221	Sctd	59	Calm	65	102	518
7-F-66	R 105	1/4	81	18	Sep. 1 0106	Clear	58	WSW-18	0	40	121
8-F-66	W 250	3	345	20	1 2023	Brkn	70	Calm	65	89	499
9-F-66	W 249	3	343	20	2 2043	Brkn	65	SW-7	65	84	492
10-F-66	R 102	1/4	83	12	4 0106	Sctd	55	WNW-20	0	38	121
11-F-66	R 230	3	323	12	5 1746	Sctd	70	S-9	45	82	450
12-F-66	R 221	3	322	20	6 2114	Clear	73	S-3	45	85	452
13-F-66	R 218	3	332	20	7 0436	Ovest	64	W-14	35	91	458
14-F-66	W 32	1/4	58.5	6	7 0714	Ovest	62	S 1-10	0	36	94.5
15-F-66	R 228	3	317	20	8 0530	Sctd	54	N-3	45	85	447
16-F-66	R 229	3	334	20	8 1857	Ovest	67	SW-5-8	45	92	471
17-F-66	R 223	3	319	12	9 2323	Sctd	50	Calm	35	39	393
C - 1	W 24	1/10	31		Aug. 25 0116	Sctd	58	NE-4		23	54
C - 2	W 25	1/10	31	5	29 0930	Sctd	48	NW-15		23	54
C - 3	W 26	1/10	33	5	29 2015	Sctd	56	NW-15		23	56
C - 4	W 27	1/10	33	5	30 0445	Sctd	54	NW-5		23	56
C - 5	W 28	1/10	33	5	Sept. 2 0936	Ovest	58	S-15		24	57
C - 6	W 29	1/10	32	5	4 0517	Ovest	58	NE-18		24	56
C - 7	W 30	1/10	33	5	6 0530	Ovest	58	S-18		24	57
C - 8	W 31	1/10	33	5	6 0920	Clear	59	SW-20		24	57
C - 9	W 28	1/4	55	5	7 2106	Ovest	47	NE-7		51	109
C - 10	W 27	1/4	56	5	8 1025	Clear	51	SE-5		51	107
C - 11	W 2	1/2	98		16 201	Ovest	44	NE-12		60	154
C - 12	W 30	1/4	57		17 0000	Clear	47	NE-8		57	114
C - 13	W 29	1/4	57		18 0000	Clear	46	NE-10		57	115

CLEARING

TABLE 2 (Concluded)

Flight No.	Free Lift (lbs)	Gross Inflation (lbs)	Helium (ft <sup>3</sup> )	Ascent Rate (ft/min)	Ceiling		Final GMD (degrees)	
					Theoretical (mbs)	Actual (gpf)	Az	El
1-F-66	21	123	1960	887/946	5.9	110,300	-	-
2-F-66	24	125	2000	868/1100	5.9	73,000	-	-
3-F-66	82	582	9300	1012/1070	2.2	129,600	275.55	08.99
4-F-66	18	114	1820	710/680	5.9	47,000	-	-
5-F-66	80	577	9300	584/401	2.2	130,000	-	-
6-F-66	90	608	9800	925/-	2.3	131,000	-	31.05
7-F-66	25	146	2350	900/-	6.6	107,000	117.85	06.25
8-F-66	90	589	9400	895/810	2.1	126,400	118.70	05.80
9-F-66	96	588	9400	890/643	2.1	128,300	322.60	00.60
10-F-66	24	145	2350	886/1020	6.8	108,600	105.90	04.50
11-F-66	81	531	8500	865/1220	2.2	130,600	324.05	09.95
12-F-66	71	523	8350	905/757	2.2	64,000	80.88	01.76
13-F-66	73	531	8500	470/-	2.2	19,500	67.20	02.55
14-F-66	20	115	1830	883/727	5.75	121,000	64.05	03.80
15-F-66	84	531	8500	1000/1080	2.1	130,000	80.90	06.35
16-F-66	92	563	9000	780/298	2.2	122,000	94.31	02.03
<del>16-F-66</del> 17-F-66	71	464	7450	956/827	2.1	128,500	96.79	05.03
C - 1	10	64	1024	800/850	7	111,000	-	-
C - 2	10	64	1024	750/850	7	111,000	-	-
C - 3	11	67	1070	850/-	6.35	47,000	-	-
C - 4	11	67	1070	850/-	6.35	25,000	-	-
C - 5	11	68	1088	850/1000	7	111,000	-	-
C - 6	11	67	1070	900/1000	6.35	111,000	-	-
C - 7	11	68	1088	-	7	-	-	-
C - 8	11	68	1088	900/950	6.35	111,000	-	-
C - 9	24	133	2128	850/-	5.5	-	-	-
C - 10	24	131	2090	920/945	5.5	117,000	-	-
C - 11	32	186	2976	900/-	-	122,000	-	-
C - 12	25	137	2192	-	5.5	-	-	-
C - 13	24	139	2224	-	5.5	114,500	-	-

SKYHOOK 1966 FLIGHT SUMMARY

## 8.0 REMARKS

- F - 1 Balloon recovered 1/2 mile north of Lintlaw, Sask.
- F - 2 Burst at 73,000 feet - recovered 10 miles west of The Pas. The load and balloon were together. The top of the balloon was shredded 5 in. from the eye bolt - no other apparent damage.
- F - 4 Leaker
- F - 5 Last observed north of Goosebay Sept. 3 by Canadian military.
- F - 6 Ballast squibs fired when connected. Flight delayed 2 hours. Instruments changed to 2 backup timers.
- F - 7 Gusty winds prior to launch caused the bubble to hit the runway. The oscillator tube in the AMT4B burned out at launch, received R-F signal only.
- F - 12 Leaker - recovered near Wabowden, Manitoba.
- F - 13 Wind picked up from near calm immediately before release in a rain squall and shifted 70 degrees from layout. The anchor truck chased the slowly rising balloon 300 feet before release. The gondola struck the ground and dragged 100 feet.
- F - 14 Wind shifted to 90 degrees from layout and picked up to 10 knots. After a long run with the package and anchor line the balloon ascended reversing climb at 43,000 feet for 5 minutes. After valving at ceiling it slowly climbed through the theoretical ceiling of 118,000 feet to over 121,000 feet during the following 4 hours.

G.T. SCHJELDAHL Co. NORTHFIELD, MINN.  
FLIGHT NO. 1 F 66  
BALLOON: 0.5 MIL WINZEN TT  
VOLUME: 250,000 FT<sup>3</sup>  
WEIGHT: 60 LBS.  
GROSS LOAD: 42 LBS. BALLAST: NONE  
FREE LIFT: 21 LBS. 20.6%

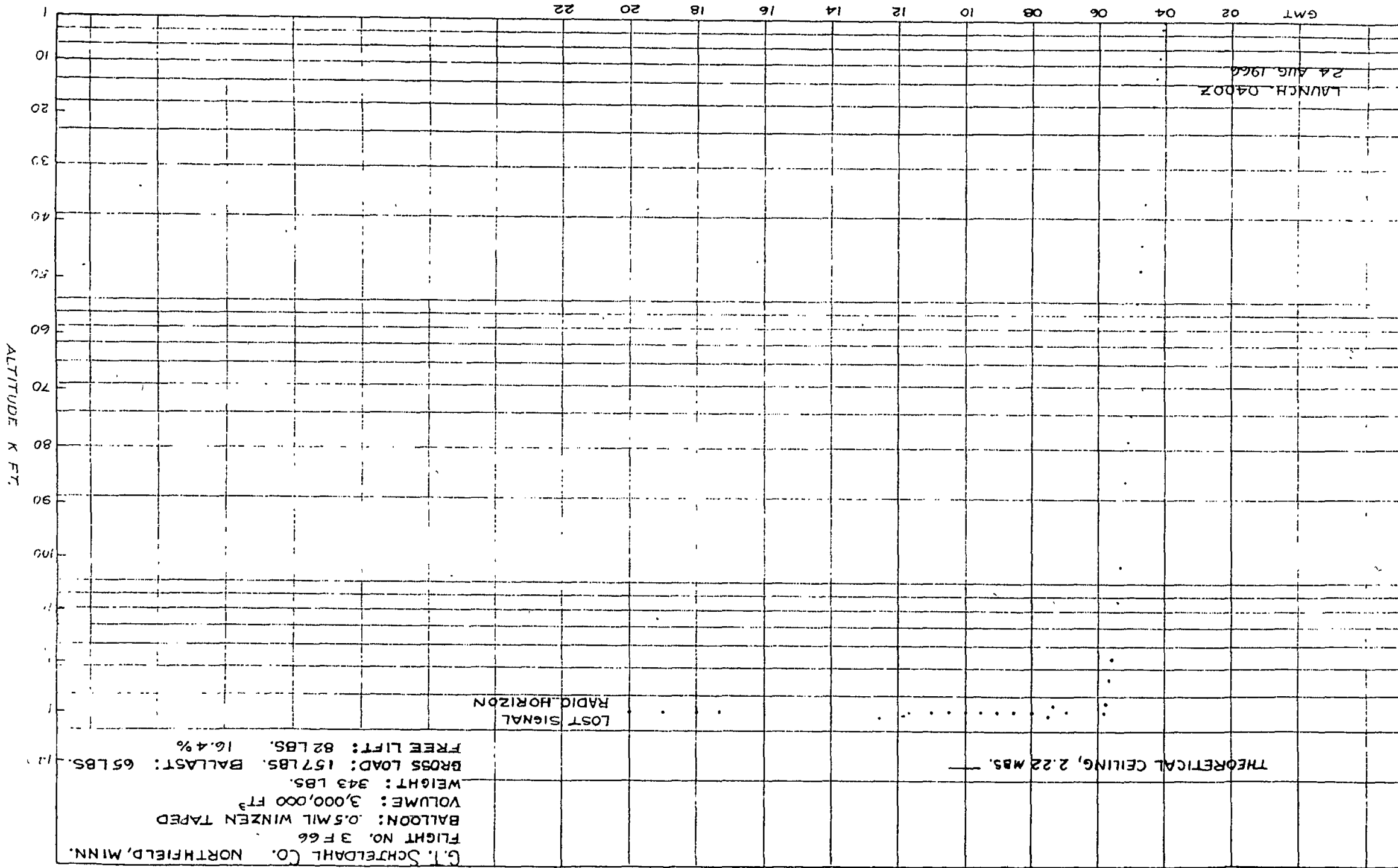
THEORETICAL CEILING — 5.95 MBS

CUT DOWN 1530Z

LAUNCH: 0154Z  
20 AUG 1966

PRESSURE MBS

GMT 00 02 04 06 08 10 12 14 16





G. F. SCHNEIDER CO NORTHFIELD, MINN.

FLIGHT NO 5 F 64

BALLOON: 0.5 MIL WINZEN TAPED

VOLUME: 3,000,000 FT<sup>3</sup>

WEIGHT: 342 LBS.

GROSS LOAD: 155 LBS. BALLAST: 65 LBS.

FREE LIFT: 80 LBS. 16.1 %

TEMPERATURE FILLING, 27.27 MBS

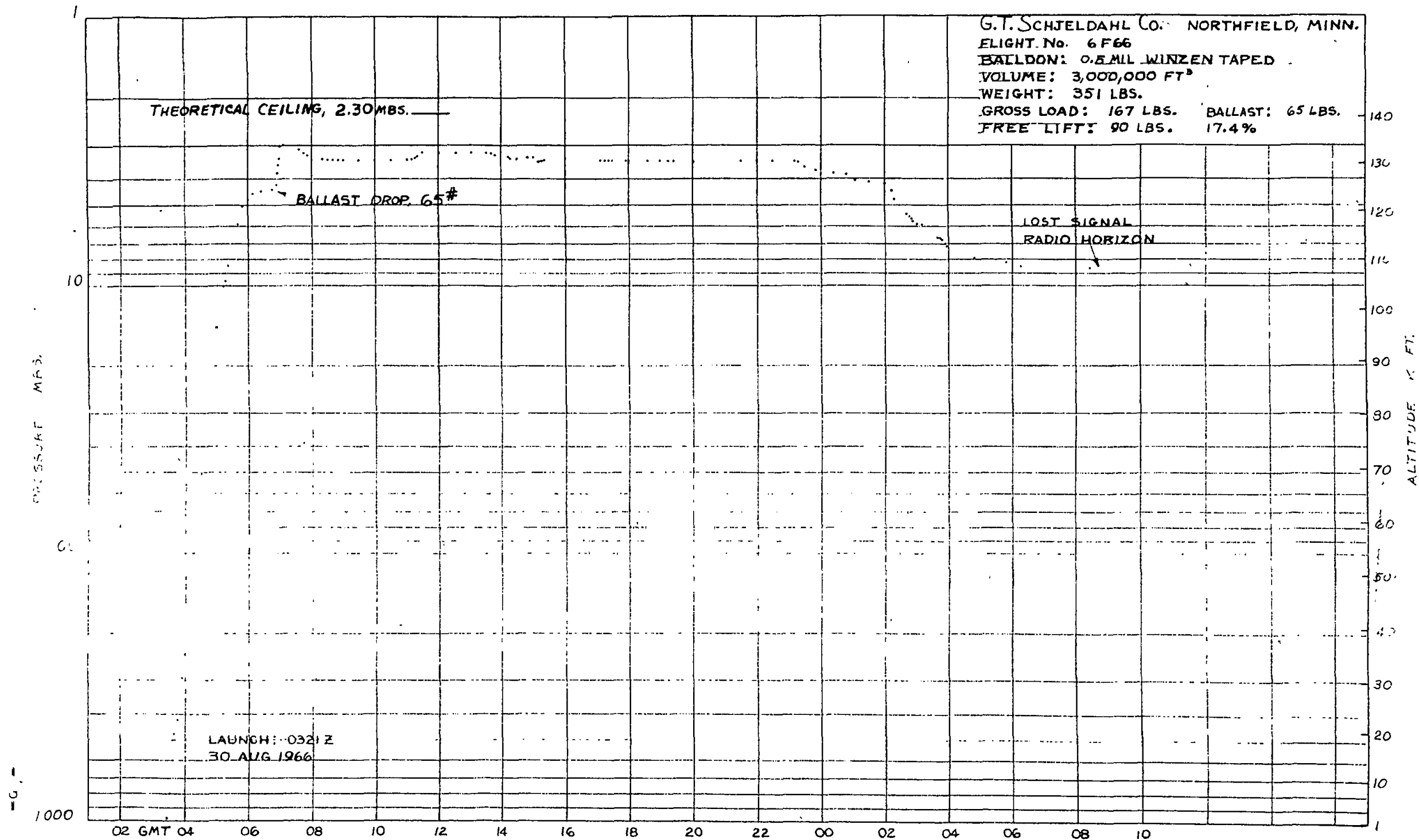
LOST SIGNAL  
RADIO HORIZON

PRESSURE MBS

ALTITUDE K FT

LAUNCH: 2213Z

29 AUG 1966



G. T. SCHJELDAHL Co. NORTHFIELD, MINN.

FLIGHT NO. 7F66

BALLOON: 0.75 MIL RAVEN TT

VOLUME: 250,000 FT<sup>3</sup>

WEIGHT: 81 LBS

GROSS LOAD: 40 LBS BALLAST: NONE

FREE LIFT: 24.8 LBS. 20.5 %

THEORETICAL CEILING 680 MBS.

LAUNCH: 0606Z  
1 SEPT. 1966

PRESSURE MBS

1000

100

10

GMT

02

00

22

20

18

16

14

12

10

08

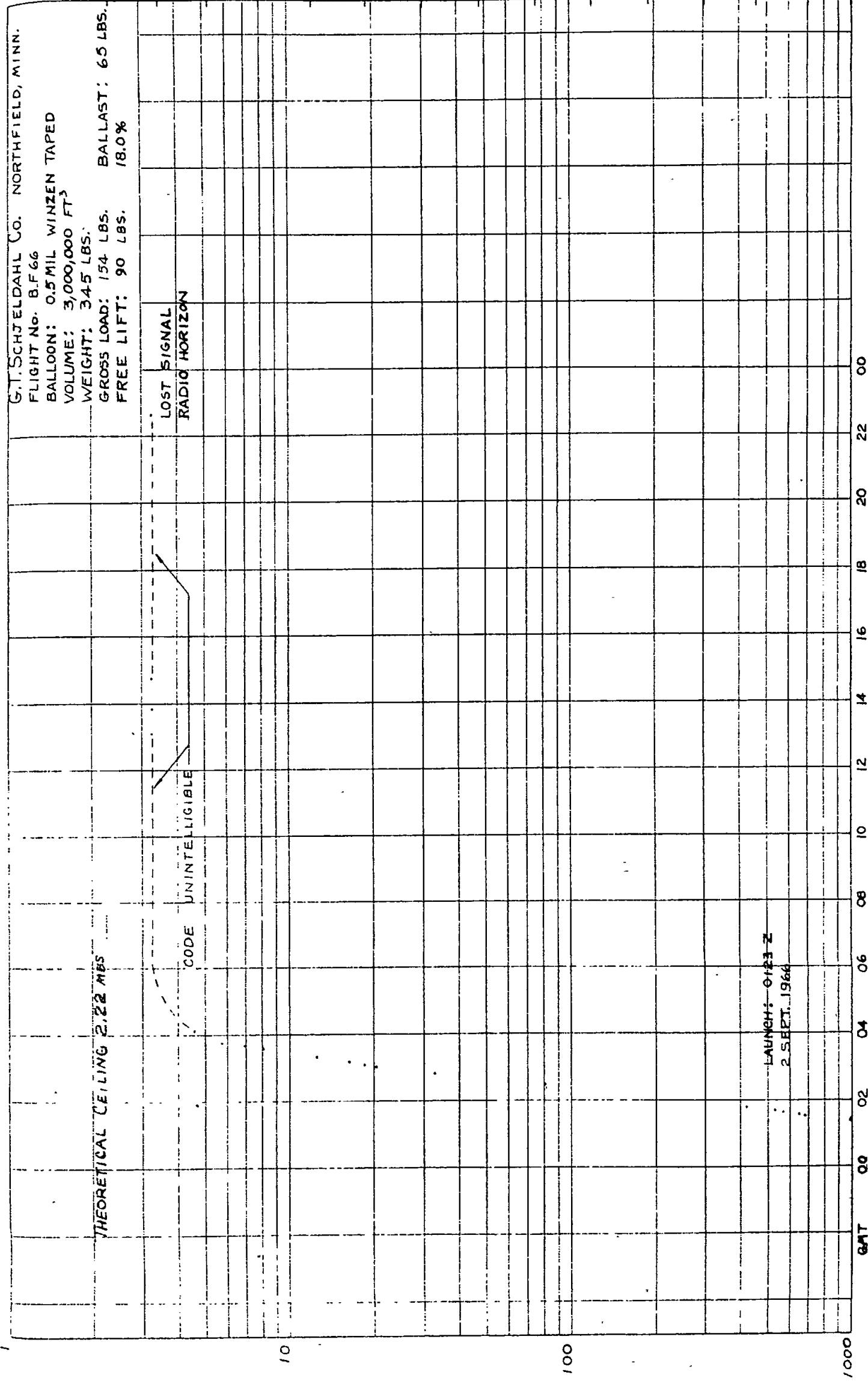
06

1000  
900  
800  
700  
600  
500  
400  
300  
200  
100  
0

K FT

PRESSURE MBS.

ALTITUDE X FT



G.T. SCHJELDAHL CO. NORTHFIELD, MINN.  
FLIGHT No. 9F66  
BALLOON: 0.5 MIL WINZEN TAPED  
VOLUME: 3,000,000 FT<sup>3</sup>  
WEIGHT: 343 LBS.  
GROSS LOAD: 149 LBS. BALLAST: 65 LBS.  
FREE LIFT: 96 LBS. 19.5%

THEORETICAL CEILING, 2.19 mbs.

LOST SIGNAL  
RADIO HORIZON

BALLAST DROP, 65#

LAUNCH: 0143Z  
3 SEPT 1966

PRESSURE MBS

ALTITUDE K FT

GMT 00 02 04 06 08 10 12 14 16

G. I. SCHJELDHAHL CO. NORTHFIELD, MINN.  
 FLIGHT No. 10F66  
 BALLOON: 0.75 MIL. RAVEN TT  
 VOLUME: 250,000  
 WEIGHT: 83 LBS.  
 GROSS LOAD: 58 LBS. BALLAST: NONE  
 FREE LIFT: 124 LBS. 19.8%

THEORETICAL CEILING 6,800 MBS.

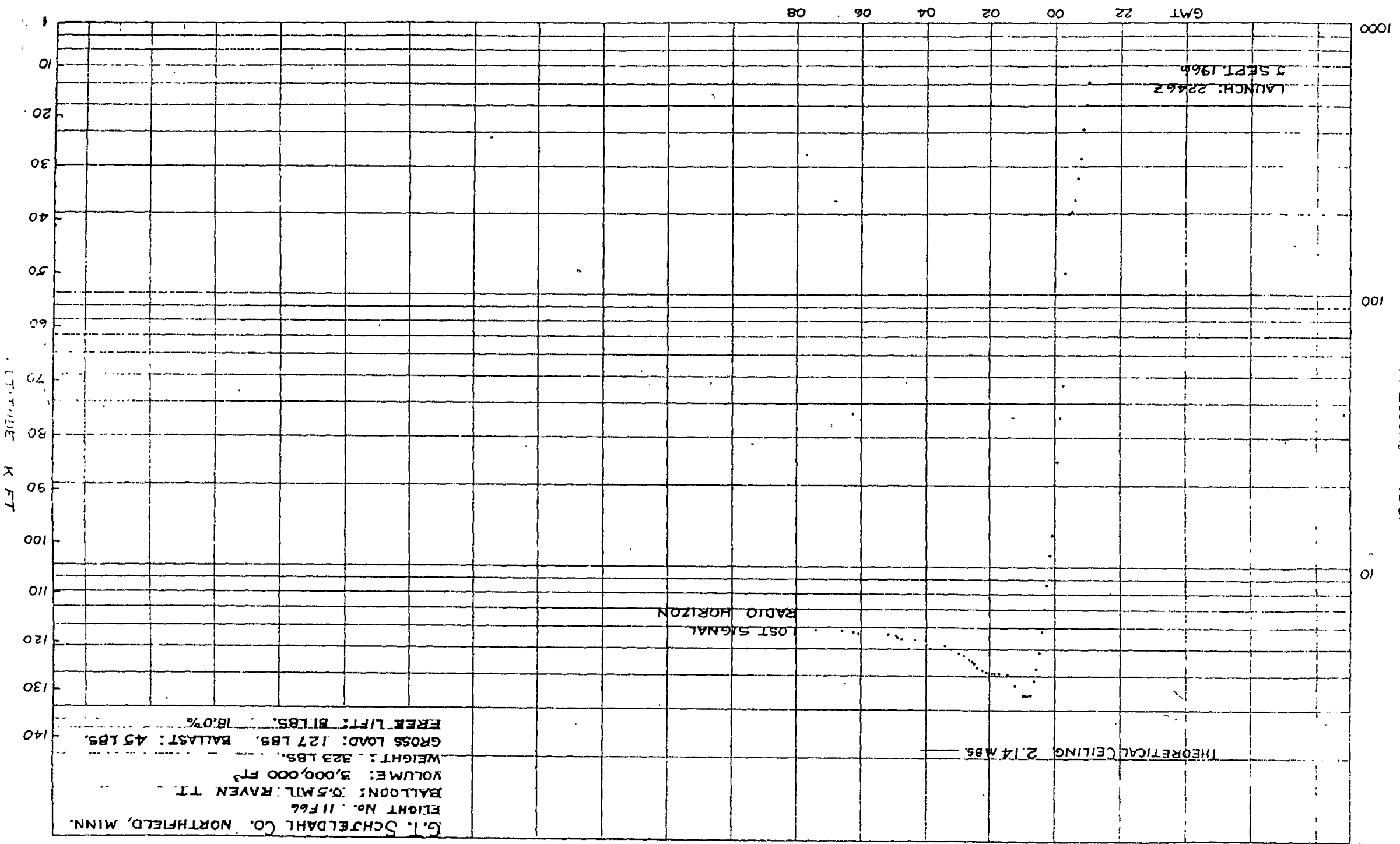
LOST SIGNAL  
 RADIO HORIZON

LAUNCH: 0606Z  
 3 SEPT. 1966

PRESSURE MBS

CAT

ALTITUDE K FT



G.T. SCHJELDAHL CO. NORTHFIELD, MINN  
FLIGHT No. 14F66  
BALLOON: 0.5 WINZEN TT  
VOLUME: 250,000 FT<sup>3</sup>  
WEIGHT: 58.5 LBS.  
GROSS LOAD: 36 LBS. BALLAST: NONE  
FREE LIFT: 20 LBS. 21.2%

THEORETICAL CEILING, 5.75 MBS.  
OFF CODE, CONTINUED TRACKING CARRIER.  
LOST CARRIER.

LAUNCH: 1214 Z  
7 SEPT. 1966

GMT 12 14 16 18 20 22

ALTITUDE IN FT  
140  
130  
120  
110  
100  
90  
80  
70  
60  
50  
40  
30  
20  
10



G. I. SCHJELDAHL CO. NORTHFIELD, MINN.  
FLIGHT No. 15F66  
BALLOON: 0.5 MIL RAVEN TT  
VOLUME: 3,000,000 FT<sup>3</sup>  
WEIGHT: 317 LBS.  
GROSS LOAD: 130 LBS BALLAST: 45 LBS  
FREE LIFT: 84 LBS. 18.8%

THEORETICAL CEILING, 2.13 MBS

WEAK SIGNAL - TRACKED UNTIL 2300 Z

LAUNCH: 1030Z

8 SEPT. 1966

GMT

10

12

14

16

18

20

140

130

120

110

100

90

80

70

60

50

40

30

20

10

1

ALTITUDE K FT

G.T. SCHJELDAHL CO. NORTHFIELD, MINN.  
FLIGHT No. 16 F 66  
BALLOON: 0.5 MIL. RAVEN TT  
VOLUME: 3,000,000 FT<sup>3</sup>  
WEIGHT: 334 LBS  
GROSS LOAD: 137 LBS. BALLAST: 45 LBS.  
FREE LIFT: 92 LBS. 19.5%

THEORETICAL CEILING, 224 MBS.

LOST SIGNAL  
RADIO HORIZON

BALLAST DROP, 45%

LAUNCH: 2357 Z  
8 SEPT 1966

PRESSURE MBS.

ALTITUDE K FT

GMT 00 02 04 06 08

G.T. SCHJELDAHL CO. NORTHFIELD, MINN.  
FLIGHT No 17F66  
BALLOON: 0.5 MIL RAVEN TT  
VOLUME: 3,000,000 FT<sup>3</sup>  
WEIGHT: 319 LBS.  
GROSS LOAD: 74 LBS. BALLAST: 35 LBS.  
FREE LIFT: 71 LBS. 18.1%

THEORETICAL CEILING 1.88 MBS. ———

LOST SIGNAL  
RADIO HORIZON

LAUNCH: 0423  
10 SEPT 1966

PRESSURE

ALTITUDE K FT

GMT 04 06 08 10 12 14 16

G. T. SCHJEDAHL Co. NORTHFIELD, MINN.  
FLIGHTS 2, 4, 12 AND 13

FLIGHT NO. 2F66  
BALLOON: 0.5 MIL WINZEN TT  
VOLUME: 250,000 FT<sup>3</sup>  
WEIGHT: 60 LBS  
GROSS LOAD: 41 LBS  
BALLAST: NONE  
FREE LIFT: 24 LBS 23.7%

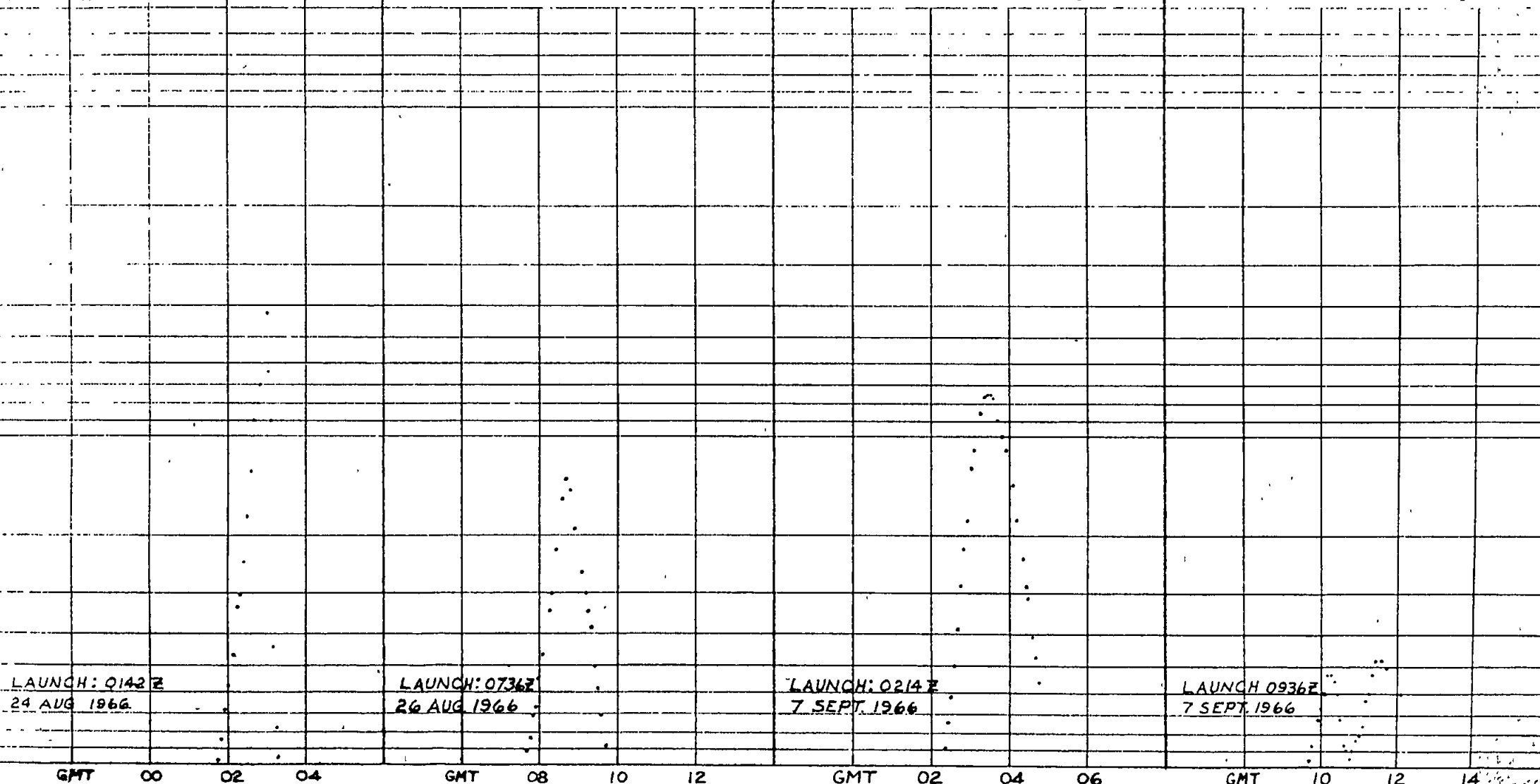
FLIGHT NO. 4F66  
BALLOON: 0.5 MIL WINZEN TT  
VOLUME: 250,000 FT<sup>3</sup>  
WEIGHT: 58 LBS  
GROSS LOAD: 38 LBS  
BALLAST: NONE  
FREE LIFT: 18 LBS 18.8%

FLIGHT NO. 12F66  
BALLOON: 0.5 MIL RAVEN TT  
VOLUME: 3,000,000 FT<sup>3</sup>  
WEIGHT: 322 LBS  
GROSS LOAD: 130 LBS  
BALLAST: 45 LBS  
FREE LIFT: 71 LBS 15.7%

FLIGHT NO. 13F66  
BALLOON: 0.5 MIL RAVEN TT  
VOLUME: 3,000,000  
WEIGHT: 332 LBS  
GROSS LOAD: 126 LBS  
BALLAST: 35 LBS  
FREE LIFT: 73 LBS 15.9%

PRESS. IN MB

ALTITUDE K FT

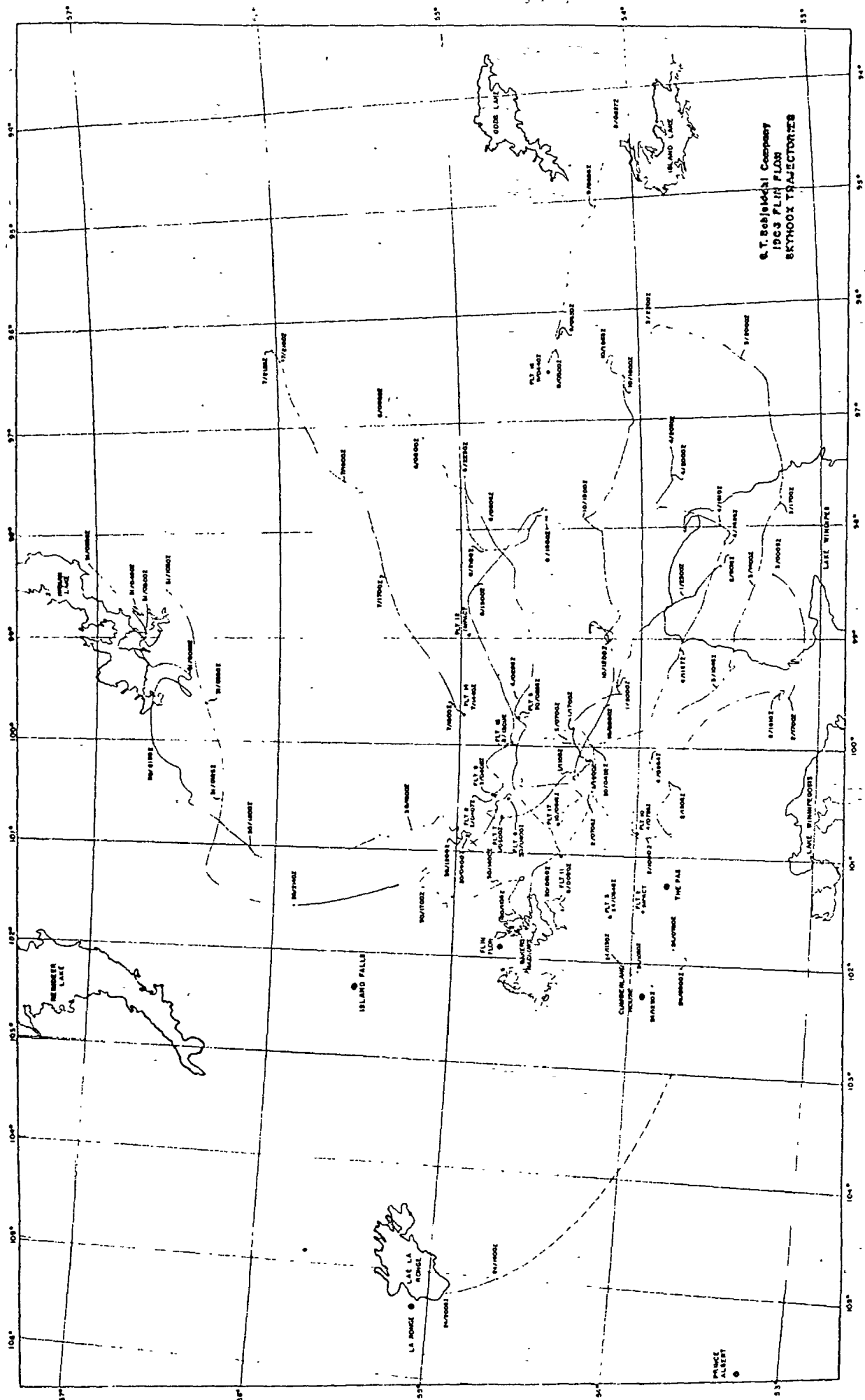


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13 ABSTRACT <p>A series of high altitude Skyhook balloon flights were made from Flin Flon Municipal Airport of Bakers Narrows, Manitoba, and from Fort Churchill, Manitoba to secure data for Dr. Kinsey A. Anderson of the Space Sciences Laboratory, Department of Physics, University of California, for his studies of radiation associated with solar magnetic storms. The planning and execution of the 30 balloon flights is described. Time-Altitude curves and balloon trajectories are included.</p>			